Citation:

Klesges RC, Klesges LM, Eck LH, Shelton ML. A longitudinal analysis of accelerated weight gain in preschool children. *Pediatrics* 1995; 95: 126-130.

PubMed ID: 7770289

Study Design:

Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To determine the dietary, physical activity, family history and demographic predictors of relative weight change in a cohort of 146 children over a three-year period.

Inclusion Criteria:

- The child participant:
  - was the natural, biological offspring of his/her parents
  - had no physical handicap or condition that could affect relative weight, dietary intake or physical activity
  - had parents who were married
  - had parents without cardiovascular disease
  - had a family who planned to stay in the metropolitan area in the coming year
- Obese children were over-sampled
- Overweight was defined as relative weight greater than 75th percentile for BMI according to USDHHS norms (1987).

Exclusion Criteria:

Those who did not meet the inclusion criteria previously noted.

Description of Study Protocol:

- Measurements of height and weight were taken on parents and children by trained research assistants
- Dietary intake was assessed with food frequency questionnaire (FFQ) revised for use with children
- Information on child's physical activity was also assessed by both parents.

Data Collection Summary:

Dependent Variables

Change in BMI over two years: Measured height and weight following standardized protocol.

Independent Variables

- Dietary intake: Total energy, % energy as carbohydrate, % energy as fat (FFQ assessed intake over the previous one-year period – completed collaboratively by both parents and their child)
- Child's physical activity: Structured, leisure and aerobic activity (Likert-type items assessed by both parents).

Control Variables

- Baseline BMI
- Gender
- Age (years)
- Family risk
- Gender by familial risk interaction
- Baseline % kcal as fat
- Aerobic activity
- Change (year two to three) in % kcal as fat
- Change (year two to three) in leisure activity.

Statistical Analysis

Multiple regression analysis.

Description of Actual Data Sample:

- *Original sample:* Baseline measures reflect 203 families (110 boys and 93 girls) in which weight status and change in weight status could be determined
- *Withdrawals/Drop-outs:* 35 families were unavailable after one year and an additional 22 at the two-year follow-up visit. No significant differences were found between those completing the study and those who did not.
- *Final sample:* 146 preschool children followed for three years
- *Location:* Memphis, TN
- *Race/Ethnicity:* Predominantly White subjects
- *SES:* 46% of the families were from upper-middle class backgrounds (predominantly middle-class subjects)
- *Age:* Three to five years at baseline.

Summary of Results:

Overall, changes in BMI were highly consistent with national trends of children of this age.

Variance Explained by Final Model

- Final model predicted 22.9% of the variability in body mass change over two years
- The largely nonmodifiable variables of initial BMI, sex, age, family risk and sex by family risk interactions accounted for 9.8% of the variance while the largely modifiable variables of dietary intake and activity variables accounted for 13.1% of the total variability in body mass change.

Dietary Predictors of Change in Body Mass

- Baseline intakes of kcal from fat as well as (changes) decreases in fat intake were related to decreases in BMI. Higher baseline levels of perctent of calories as fat were associated with greater increases in BMI (0.168kg per m^2 per 5%) as were recent increases (year two to year three) in the percentage of intake as fat (0.201kg per m^2 per 5% change).
- Neither baseline total kcal (P=0.32) nor change in total kcal (P=0.54) increased the variance in change in body mass. Total kcal, by themselves, were found to relate to weight gain. However, when fat kcal are entered into the equation, it explains somewhat more of the variance than total kcal (and was no longer a significant predictor of weight gain).

Author Conclusion:

- Modifiable variables (i.e., dietary intake, physical activity) accounted for more of the variance in changes in child BMI change than non-modifiable variables (e.g., number of parents obese)
- These results strongly suggest that encouragement in heart healthy dietary intake patterns and participation in physical activity can decrease accelerated weight gain and obesity, even in preschool children.

Reviewer Comments:

- *Strengths: Longitudinal nature of study*
- *Limitations: Mostly middle-class, White population, thus results may not be generalizable to other groups.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes

4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	No
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	No
6.6.	Were extra or unplanned treatments described?	No
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes

7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes